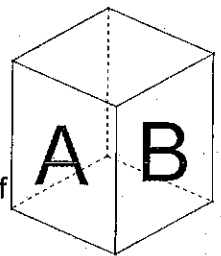


Name \_\_\_\_\_

Date \_\_\_\_\_

### 291 Three Variable Word Problems

1. In a coin bank, there are three times as many dimes as there are nickels and quarters combined. There are 24 coins that total a value of \$2.90. How many of each kind are there?
2. The width of a rectangular box is twice the height. Twice the length of the box exceeds the sum of the width and the height by 5. Given that the sum of the length, width, and height is 16 cm, find the length, width, and the height of the box.
3. Ron, Hank, and Louise have a total of 52 tropical fish. If Louise had 6 more fish she would have as many as the boys have put together. Hank has three more fish than Ron. How many fish does each of the three have?
4. The proceeds from the school car wash in one, five, and ten dollar bills come to a total of \$355. If there are 120 bills altogether, and twice as many one dollar bills as five and ten dollar bills combined, how many bills of each denomination are there?
5. A collection of 38 coins (nickels, dimes, and quarters) has a value of \$3.70. There are twice as many dimes as quarters. How many of each coin are in the collection?
6. The total value of 69 coins is \$7.80. There are 3 more nickels than dimes and quarters combined. How many of each coin are in the collection?
7. A rectangular box has a base that has a perimeter of 30cm. Side A has a perimeter of 24 cm, and side B has a perimeter of 26cm. Find the dimensions of the box.
8. A breakfast consisting of a glass of milk, shredded wheat, and one egg supplies 17 grams of protein. If you eat 3 eggs and a glass of milk there are 29 grams of protein. And, shredded wheat and 2 glasses of milk provides 18 grams of protein. What is the protein in each item?
9. Lorraine has \$83 in one, five, and ten-dollar bills. She has just as many one-dollar bills as she has five-dollar bills and ten-dollar bills together. If she has 16 bills in all, how many of each denomination does she have?
10. At a college basketball game, student tickets cost \$3 each, adult tickets cost \$4.50 each, and children's tickets cost \$2.50 each. Four times as many adult tickets as children's tickets were sold. The total number of adult's tickets and children's tickets was half the number of student's tickets. If \$8,736.50 was taken in receipts, how many of each type of ticket was sold?



$$\begin{aligned}
 (1) \quad d &= 3n + 3q \\
 n + d + q &= 24 \\
 5n + 10d + 25q &= 290 \\
 \text{simply } n + 2d + 5q &= 58 \\
 n + 2(3n + 3q) + 5q &= 58 \\
 n + 6n + 6q + 5q &= 58 \\
 \boxed{7n + 11q} &= 58
 \end{aligned}$$

4 quarters 18 dimes  
2 nickels

Use subs., Sub ① into ② + ③

$$\begin{aligned}
 n + 3n + 3q + q &= 24 \\
 4n + 4q &= 24 \\
 \boxed{n + q} &= 6
 \end{aligned}$$

$$\begin{aligned}
 7n + 11q &= 58 \\
 -7n - 7q &= -42 \\
 \hline
 4q &= 16 \\
 q &= 4
 \end{aligned}$$

$$\begin{aligned}
 (2) \quad w &= 2h \\
 2l &= w + h + 5 \\
 l + w + h &= 16 \\
 l + 2h + h &= 16 \\
 \boxed{l + 3h} &= 16
 \end{aligned}$$

$$\begin{aligned}
 \text{Sub ① into ② + ③} \\
 2l &= 2h + h + 5 \\
 \boxed{2l} &= 3h + 5 \\
 2l - 3h &= 5 \\
 l + 3h &= 16 \\
 \hline
 3l &= 21 \\
 \boxed{l = 7\text{cm} \quad w = 6\text{cm} \quad h = 3\text{cm}}
 \end{aligned}$$

$$\begin{aligned}
 (3) \quad R + H + L &= 52 \\
 L + 6 &= R + H \\
 H &= R + 3 \\
 L + 6 &= R + 3 + R \\
 L + 6 &= 2R + 3 \\
 \boxed{-2R + L} &= -3
 \end{aligned}$$

$$\begin{aligned}
 \text{sub ③ into ① + ②} \\
 R + R + 3 + L &= 52 \\
 \boxed{2R + L} &= 49 \\
 -2R + L &= -3 \\
 \hline
 2L &= 46 \\
 L &= 23
 \end{aligned}$$

Louise 23 fish  
Hank 16 fish  
Rom 13 fish

$$\begin{aligned} \textcircled{4} \quad N + F + T &= 120 \\ N + 5F + 10T &= 355 \\ N &= 2F + 2T \end{aligned}$$

$$2F + 2T + 5F + 10T = 355$$

$$\textcircled{7F + 12T = 355}$$

$$\underline{-7F - 7T = -280}$$

$$5T = 75$$

$$T = 15$$

sub ③ into ① + ②

$$2F + 2T + F + T = 120$$

$$3F + 3T = 120$$

$$\textcircled{F + T = 40}$$

15 Ten's

25 Five's

80 One's

$$\begin{aligned} \textcircled{5} \quad N + D + Q &= 38 \\ 5N + 10D + 25Q &= 370 \end{aligned}$$

$$D = 2Q$$

$$N + 2Q + Q = 38$$

$$\textcircled{N + 3Q = 38}$$

6 quarters

20 nickels

12 dimes

$$\rightarrow N + 2D + 5Q = 74$$

$$N + 2(2Q) + 5Q = 74$$

$$\textcircled{N + 9Q = 74}$$

$$\underline{-N - 3Q = -38}$$

$$6Q = 36$$

$$Q = 6$$

simplify ②, then sub ③ into ① + ②

$$\textcircled{6} \quad N + D + Q = 69$$

$$5N + 10D + 25Q = 780 \rightarrow N + 2D + 5Q = 156$$

$$N = D + Q + 3$$

$$D + Q + 3 + 2D + 5Q = 156$$

$$D + Q + 3 + D + Q = 69$$

$$3D + 6Q = 153$$

$$2D + 2Q = 66$$

$$\textcircled{D + 2Q = 51}$$

$$\underline{-D - Q = -33}$$

$$Q = 18$$

18 quarters

15 dimes

36 nickels

$$\textcircled{D + Q = 33}$$

$$\textcircled{7} \quad 2l + 2w = 30$$

$$2l + 2h = 24$$

$$2w + 2h = 26$$

Simplify all 3, eliminate  $l$  for  $\textcircled{1} + \textcircled{2}$

$$l + w = 15$$

$$l + h = 12$$

$$\textcircled{w + h = 13}$$

$$\textcircled{w - h = 3}$$

$$w + h = 13$$

$$2w = 16$$

$$\boxed{w = 8\text{cm} \quad l = 7\text{cm} \quad h = 5\text{cm}}$$

$$\textcircled{8} \quad M + W + E = 17$$

$$\textcircled{M + 3E = 29}$$

$$2M + W = 18$$

Eliminate  $W$  using  $\textcircled{1} + \textcircled{2}$

$$2M + W = 18$$

$$-M - W - E = -17$$

$$\textcircled{M - E = 1}$$

$$-M - 3E = -29$$

$$-4E = -28$$

$$E = 7$$

2g protein  
7 Eggs

2g in shredded wheat

8g in Milk

Subst  $\textcircled{3}$  into  $\textcircled{1} + \textcircled{2}$

$$\textcircled{9} \quad N + F + T = 16$$

$$N + 5F + 10T = 83$$

$$N = F + T$$

$$F + T + F + T = 16$$

$$2F + 2T = 16$$

$$\textcircled{F + T = 8}$$

$$F + T + 5F + 10T = 83$$

$$\textcircled{6F + 11T = 83}$$

$$-6F - 6T = -48$$

$$5T = 35$$

$$T = 7$$

$$\boxed{7\text{ Teens} \quad 8\text{ ones} \quad 1\text{ Five}}$$

$$\textcircled{10} \quad 3s + 4.5a + 2.5c = 8736.50$$

$$a = 4c$$

$$a + c = \frac{1}{2}s$$

$$4c + c = \frac{1}{2}s$$

$$5c = \frac{1}{2}s$$

$$\textcircled{10c = s}$$

sub  $\textcircled{2}$  into  $\textcircled{1} + \textcircled{3}$

$$3s + 4.5(4c) + 2.5c = 8736.50$$

$$3s + 18c + 2.5c$$

$$\textcircled{3s + 20.5c = 8736.50}$$

$$3(10c) + 20.5c = 8736.50 \rightarrow c = 173$$

children  
173 ~~students~~  
1730 students  
692 Adult